



**Custom-Engineered
Solutions for the
Nuclear
Power Industry
from SOR®**

As the world's aging nuclear power plants continue to be challenged with maintenance and replacement issues, keeping pressure, temperature and vacuum switches operational looms as a growing concern.

The problem grows more acute as long-time suppliers discontinue their nuclear products and services.



Instrumentation Solutions for the Nuclear Power Industry

Help Solve Obsolescence Issues and Improve Process Efficiency

SOR nuclear-qualified pressure, temperature and vacuum switches are especially relevant in today's marketplace. Our engineering expertise is specifically targeted to meet the unique demands of the nuclear power generation industry and provide solutions. We call it custom engineering and today we build a variety of 1E-qualified mechanical pressure, vacuum, and temperature switches to meet your specifications.

Current Plant Solutions

- **Management of Change (MOC):** SOR provides products approved as form, fit and function.
- **On/off functions:** SOR instruments are among the most reliable devices for redundant safeties, alarms and other applications.
- **Discontinued product/supplier issues:** SOR has experience in custom engineering products for the nuclear power generation industry.
- **Diminishing manufacturing sources:** SOR can fill the gap.

New Plant Designs

- SOR has taken an application-specific approach to manufacturing for more than 30 years.
- We have experience in working with nuclear plants on the engineering and manufacture of application-specific solutions to meet unique situations.

SOR Nuclear-Qualified* Instruments

Compliant

- 10CFR50, Appendix B
- ANSI N45.2
- NQA-1 (including reporting)
- ASME Section III, subsection NC and ND

Qualified by a combination of testing and analysis

- IEEE-323-1974 & 1983
- IEEE-344-1975 & 1987

Audited by

- Nuclear Procurement Issues Committee (NUPIC)
- Nuclear Industry Assessment Committee (NIAC)
- Canadian Technical Standards & Safety Authority (TSSA) N285.0
- Registered Quality System to ISO 9001:2000

* Compliance and qualification depends on the individual instruments.





Form, Fit and Functional Replacement and New-Build Switches

Differential Pressure Switches

SOR differential pressure switches are prime examples of our continued commitment to nuclear-qualified products. They were developed in conjunction with a customer who needed to meet a challenge specific to the nuclear power-generation industry. Basic models with standard wetted parts are normally suitable for air, water, and non-corrosive fluids. The pressure sensing assembly is a diaphragm/piston combination. Switching elements are SPDT or DPDT.



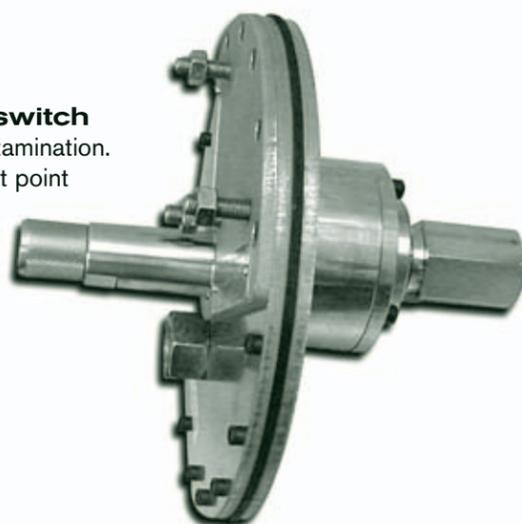
Series 131 is suited for medium differential pressure applications such as main steam line and high-flow MSIV isolation.

Series 141 is suited for low differential pressure applications such as:

- Residual heat removal (shutdown cooling mode), high-suction flow isolation
- LPCS minimum-flow bypass
- RHR A (LPCI mode) minimum-flow bypass
- High-pressure core spray, minimum-flow bypass
- RCIC steam line, high-flow isolation

The SOR® 27LP differential pressure switch was originally designed to protect airlocks from contamination. It's ideal for media applications that require a low set point and low dead band.

- Adjustable range of 0 to 0.2 kPa (typical dead band 0.025)
- Maximum operating pressure 86.2 kPa
- Live zero – may be mounted in any orientation
- Meets CSA N-285, Class 2 requirements
- 316SS diaphragm and piston
- All wetted parts are 316SS
- EPR seals
- Radiation resistant epoxy



Temperature Switches



- Carbon-steel housing for HELB applications
- Stainless steel housing for HELB applications
- Ductile-iron housing for HELB applications



- Conduit seals available in varying wire lengths.

Vacuum Switches



- Carbon-steel housing for HELB applications
- Stainless steel housing for HELB applications
- Ductile-iron housing for LOCA and HELB applications

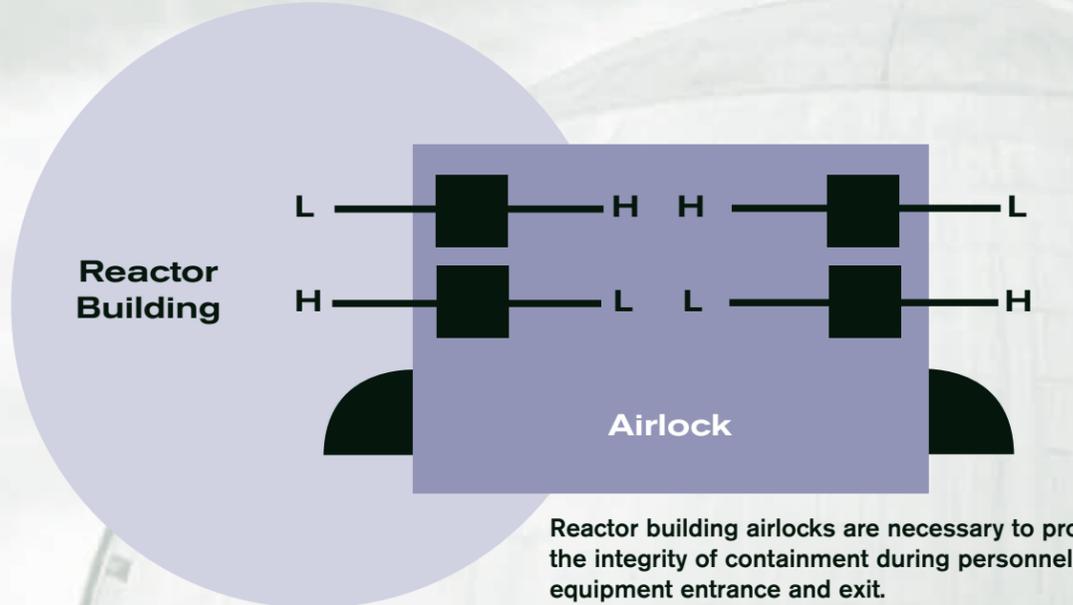
Pressure Switches



- Carbon-steel housing for HELB applications
- Stainless steel housing for HELB applications
- Ductile-iron housing for LOCA and HELB applications



Application



Reactor building airlocks are necessary to protect the integrity of containment during personnel and equipment entrance and exit.

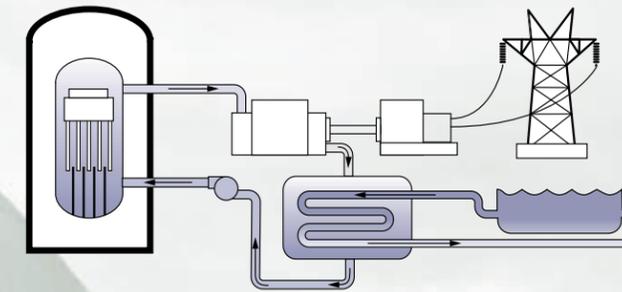
Reactor Building Airlocks

SOR was contacted by a major North American power generating utility to provide four of the six differential pressure switches needed for six airlocks in each of six buildings. Airlocks (AL) AL-1, 2 and 3 have both personnel and equipment doors. AL-4, 5 and 6 are for personnel only. Equipment doors are operated manually. Personnel doors may be operated manually or automatically.

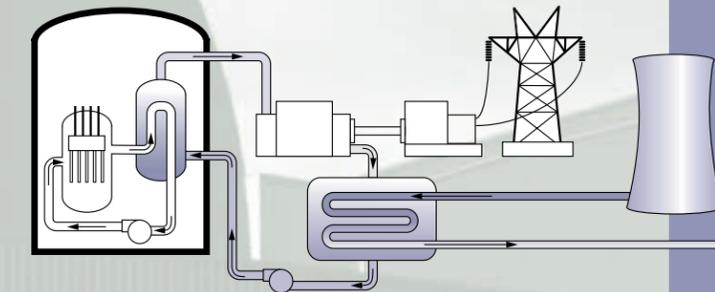
SOR engineering worked closely with the customer to develop the following solution.

When the "Door Open" to the Reactor Auxiliary Bay (RAB) side is pressed, the equalizer valve shifts to open at the RAB end. If no differential pressure exists across the door, the seals deflate, the locks withdraw, and when the door opens, a "Door Open" timer is activated. When the time expires, the door closes, the locks are re-activated and the seals re-inflate.

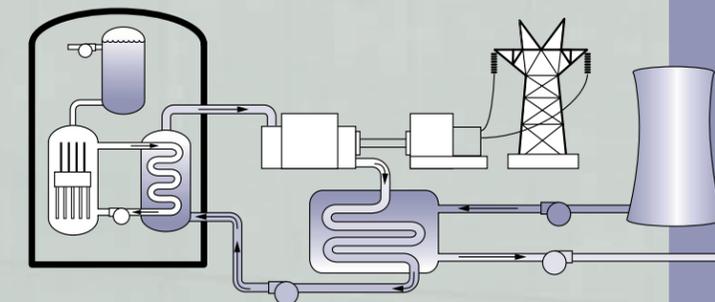
The SOR 27LP pressure switch prevents the personnel door locks from withdrawing until the differential pressure across the door is below 0.4" W.C. – the level at which differential pressure will not be great enough to move the door against the torque exerted by the cylinder actuator. If, for any reason, the differential pressure exceeds 0.4" W.C., the contact of one of the switches opens on the side where the differential pressure exists. The door locks remain sealed and the door will not open until the contact closes.



Boiling Water Reactor



Pressurized Water Reactor



CANDU Reactor Design

- Reactor Core Isolation Cooling
- Residual Heat Removal/Low Pressure Inject
- Reactor Protection
- Reactor Low Water Level Scram Sensor
- Reactor Recirculation
- Main Steam Line
- High Pressure Core Spray
- Nuclear Steam Supply
- Main Feedwater Supply
- Auxiliary Feedwater Supply
- Nuclear Service Water
- Loss of Cooling Water Feed Lines
- Component Cooling Water
- EEDDAA – Diesel Starting Air
- Supply ION Pool Support
- Essential Service Water
- Air Lock Door Systems
- Turbine High Pressure/Low Pressure Protection
- Stand-by Diesel Generator Protection
- High Lubricant Pressure Protection
- Low Lubricant Pressure Protection
- Ambient Temperature Protection for 1E Valves
- Spent Fuel Pool Leak Detection
- Turbine Stage Pressure Difference
- Fan On-Off Indication
- Pump Suction Pressure
- Boric Acid Tank (Loss of Water Level)
- Auxiliary Feedwater Pump Case Pressure
- Containment Fire Protection
- Hydrogen Analyzers



SOR® manufactures 1E-Qualified products for existing and new-build nuclear plants as well as an extensive line of non-1E pressure, level, vacuum and temperature switches for the power industry.

Differential Pressure Switches



Level

Temperature Pressure

Pressure Switches



Flow

Temperature Switches



Vacuum Switches



Process Instrumentation

We Deliver Quality On Time

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